CLAIMS

We claim:

1. A method for identifying potential noise failures in an integrated circuit design comprising:

locating a victim net and an aggressor within the integrated circuit design;

modeling the victim net using two π-type resistor-capacitor (RC) circuits, including determining a coupling between the victim net and the aggressor; and

indicating that the integrated circuit design requires modification if modeling the victim net indicates that a potential noise failure may occur in the integrated circuit design.

2. The method defined in Claim 1 wherein modeling the victim net using two π-type resistor-capacitor (RC) circuits comprises modeling the victim net with one π-type RC circuit before a coupling location and one π-type RC circuit after the coupling location.

3. The method defined in Claim 1 wherein modeling the victim net comprises determining noise width.

4. The method defined in Claim 3 wherein the noise width is determined corresponding to:

$$t_v \ln\left[\frac{\left(t_x - t_r v_t\right)\left(e^{t_r/t_v} - 1\right)}{t_r v_t}\right]$$

where t_r comprises transition time, t_v comprises distributed Elmore delay of the victim net, and v_t comprises a threshold voltage.

5. The method defined in Claim 4 wherein the threshold voltage is set to half of the peak noise voltage.

6. The method defined in Claim 3 wherein the noise width is determined corresponding to:

$$t_r + t_v \ln\left[\frac{1 - e^{-2t_r/t_v}}{1 - e^{-t_r/t_v}}\right]$$

where t_r comprises transition time and t_v comprises a distributed Elemore delays of the victim net.

7. The method defined in Claim 3 wherein the noise width is based on only transition time and distributed Elmore delay of the victim net.

8. The method defined in Claim 3 wherein the noise width is independent of an RC delay term from upstream resistance of the coupling element times coupling capacitance of the coupling location.

9. The method defined in Claim 1 wherein modeling the victim net comprises determining the peak noise amplitude.

10. The method defined in Claim 9 wherein the peak noise amplitude is determined according to:

$$\frac{(R_d + R_s)C_x}{R_d(C_1 + C_x + C_2 + C_L) + R_s(C_x + C_2 + C_L) + R_e C_L}$$

11. The method defined in Claim 1 wherein modeling the victim net comprises computing crosstalk noise at a sink with a lumped capacitance at each branch incorporated on a path from a source to the sink, with lumped capacitances being added in a weighted manner based on their locations on the path.

12. An article of manufacture comprising one or more recordable medium having executable instructions stored thereon which, when executed by a system, cause the system to:

locate a victim net and an aggressor within the integrated circuit design;

model the victim net using two π-type resistor-capacitor (RC) circuits, including determining a coupling between the victim net and the aggressor; and

indicate that the integrated circuit design requires modification if modeling the victim net indicates that a potential noise failure may occur in the integrated circuit design.

13. The article of manufacture defined in Claim 12 further comprising instructions to model the victim net with one π-type RC circuit before a coupling location and one π-type RC circuit after the coupling location.

14. The article of manufacture defined in Claim 12 wherein instructions to model the victim net comprise instructions to determine noise width.

15. The article of manufacture defined in Claim 14 wherein the noise width is determined corresponding to:

$$t_v \ln\left[\frac{(t_x - t_r v_t)\left(e^{t_r/t_v} - 1\right)}{t_r v_t}\right]$$

where t_r comprises transition time, t_v comprises distributed Elmore delay of the victim net, and v_t comprises a threshold voltage.

16. The article of manufacture defined in Claim 15 wherein the threshold voltage is set to half of the peak noise voltage.

17. The article of manufacture defined in Claim 14 wherein the noise width is determined corresponding to:

$$t_r + t_v \ln\left[\frac{1 - e^{-2t_r/t_v}}{1 - e^{-t_r/t_v}}\right]$$

where t_r comprises transition time and t_v comprises a distributed Elemore delays of the victim net.

18. The article of manufacture defined in Claim 14 wherein the noise width is based on only transition time and distributed Elmore delay of the victim net.

19. The article of manufacture defined in Claim 14 wherein the noise width is independent of an RC delay term from upstream resistance of the coupling element times coupling capacitance of the coupling location.

20. The article of manufacture defined in Claim 12 wherein instructions to model the victim net comprise instructions to determine the peak noise amplitude.

21. The article of manufacture defined in Claim 20 wherein the peak noise amplitude is determined according to:

$$\frac{(R_d + R_s)C_x}{R_d(C_1 + C_x + C_2 + C_L) + R_s(C_x + C_2 + C_L) + R_e C_L}$$

22. The article of manufacture defined in Claim 12 wherein instructions to model the victim net comprise instructions to compute

crosstalk noise at a sink with a lumped capacitance at each branch incorporated on a path from a source to the sink, with lumped capacitances being added in a weighted manner based on their locations on the path.

23. An apparatus for identifying potential noise failures in an integrated circuit design comprising:

means for locating a victim net and an aggressor within the integrated circuit design;

means for modeling the victim net using two π-type resistor-capacitor (RC) circuits, including means for determining a coupling between the victim net and the aggressor; and

means for indicating that the integrated circuit design requires modification if modeling the victim net indicates that a potential noise failure may occur in the integrated circuit design.

24. The apparatus defined in Claim 23 wherein the means for modeling the victim net using two π-type resistor-capacitor (RC) circuits comprises means for modeling the victim net with one π-type RC circuit

before a coupling location and one π-type RC circuit after the coupling location.

25. The apparatus defined in Claim 23 wherein the means for modeling the victim net comprises means for determining noise width.

26. The apparatus defined in Claim 25 wherein the noise width is determined corresponding to:

$$t_v \ln\left[\frac{(t_x - t_r v_t)(e^{t_r/t_v} - 1)}{t_r v_t}\right]$$

where t_r comprises transition time, t_v comprises distributed Elmore delay of the victim net, and v_t comprises a threshold voltage.

27. The apparatus defined in Claim 26 wherein the threshold voltage is set to half of the peak noise voltage.

28. The apparatus defined in Claim 25 wherein the noise width is determined corresponding to:

$$t_r + t_v \ln\left[\frac{1 - e^{-2t_r/t_v}}{1 - e^{-t_r/t_v}}\right]$$

where t_r comprises transition time and t_v comprises a distributed Elemore delays of the victim net.

29. The apparatus defined in Claim 25 wherein the noise width is based on only transition time and distributed Elmore delay of the victim net.

30. The apparatus defined in Claim 25 wherein the noise width is independent of an RC delay term from upstream resistance of the coupling element times coupling capacitance of the coupling location.

31. The apparatus defined in Claim 23 wherein the means for modeling the victim net comprises means for determining the peak noise amplitude.

32. The apparatus defined in Claim 31 wherein the peak noise amplitude is determined according to:

$$\frac{(R_d + R_s)C_x}{R_d(C_1 + C_x + C_2 + C_L) + R_s(C_x + C_2 + C_L) + R_e C_L}$$

33. The apparatus defined in Claim 23 wherein the means for modeling the victim net comprises computing crosstalk noise at a sink with a lumped capacitance at each branch incorporated on a path from a source to the sink, with lumped capacitances being added in a weighted manner based on their locations on the path.